EOS Mission Support Network
Performance Report

This is a monthly summary of EMSnet performance testing -- comparing the measured performance against the requirements.

Highlights:

- Test results remain stable – **all "adequate" or better!**

- The "integrated" web site (adding iperf and user flow data) has been combined with the EMSnet web site – 1 week "integrated" data is now available on the EMSnet web pages: http://ensight.eos.nasa.gov/Networks/emsnet/index.shtml (5 month integrated graphs are under development).

- Testing added from GSFC-PTH to LaTIS to provide a basis for evaluation of the impact of network changes under discussion. Initial performance is similar to performance to LDAAC

Ratings:

Rating Categories:

Excellent : **Total Kbps** > Requirement * 3
Good : 1.3 * Requirement <= **Total Kbps** < Requirement * 3
Adequate : Requirement < **Total Kbps** < Requirement * 1.3
Low : **Total Kbps** < Requirement .
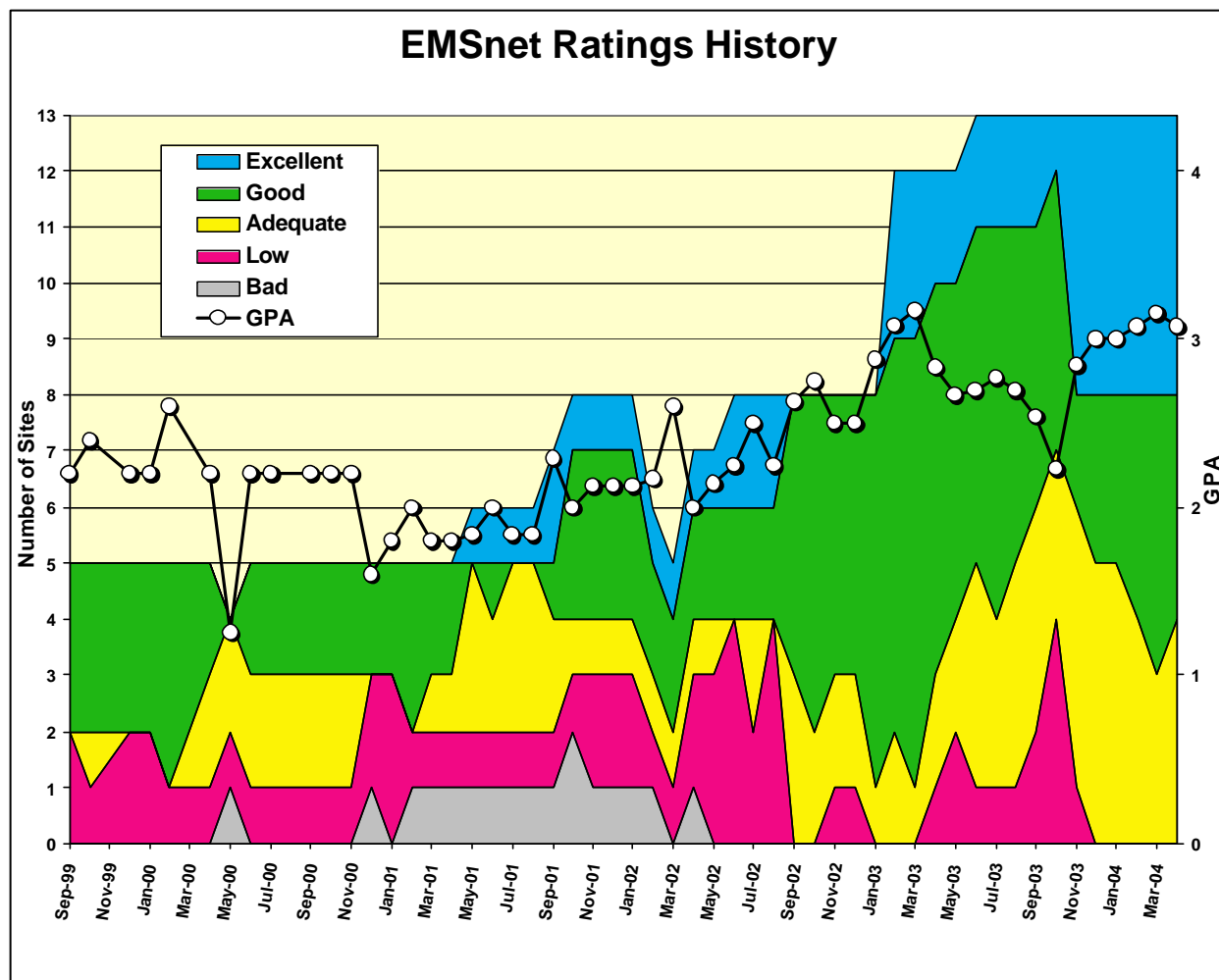**Bad** : **Total Kbps** < Requirement / 3

Where Total Kbps = User Flow + iperf monthly average

Ratings Changes:

Upgrades: ⬆: None

Downgrades: ⬇:
   GSFC → LaRC: Good → **Adequate**
       (performance stable; requirement increased)

EMSnet Ratings History

The chart above shows the number of sites in each classification since EMSnet testing started in September 1999. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: 0

EMSnet Sites
Network Requirements vs. Measured Performance

April 2004		Requirements (kbps)		Testing						
Source → Destination	Team (s)	Current Apr-04	Future Oct-04	Source → Dest Nodes	Avg User Flow kbps	Perf Avg kbps	Total Avg kbps	Current Status re Apr-04	Prev Stat	Current Status re Oct-04
GSFC --> NOAA	Quikscat	189	189	GSFC-CSAFS → NESDIS	351	2929	3280	Excellent	E	Excellent
GSFC --> EDC	MODIS, LandSat	285361	285361	GSFC-PTH → EDC DAAC	133742	265594	399335	GOOD	G	GOOD
GSFC --> ERSDAC	ASTER	568	568	GDAAC → ERSDAC	73	785	857	GOOD	G	GOOD
GSFC --> JPL	ASTER, QuikScat, MLS, etc.	1597	1597	CSAFS → JPL-SEAPAC	1240	5970	7210	Excellent	E	Excellent
JPL --> GSFC	AMSR, etc.	625	625	JPL-PODAAC → GDAAC	402	12241	12643	Excellent	E	Excellent
LaRC --> JPL	TES, MISR	40311	40311	LDAAC → JPL-TES	3334	40260	43594	Adequate	A	Adequate
GSFC --> LaRC	CERES, MISR, MOPITT	59401	59401	GDAAC → LDAAC	22190	50456	72645	Adequate	G	Adequate
LaRC --> GSFC	MODIS, TES	31784	31784	LDAAC → GDAAC	328	50669	50997	GOOD	G	GOOD
US --> JAXA	QuikScat, TRMM, AMSR	1986	1986	GSFC-CSAFS → JAXA	527	2038	2565	Adequate	A	Adequate
JAXA --> US	AMSR	512	512	JAXA → JPL-SEAPAC	145	2315	2460	Excellent	E	Excellent
JPL --> NSIDC	AMSR	1342	1342	JPL-PODAAC → NSIDC SIDADS	883	6206	7089	Excellent	E	Excellent
NSIDC --> GSFC	MODIS, ICESAT, QuikScat	13326	13326	NSIDC DAAC → GDAAC	271	16776	17047	Adequate	A	Adequate
GSFC --> NSIDC	MODIS, ICESAT, QuikScat	66907	78410	GSFC-PTH → NSIDC DAAC	9312	90934	100246	GOOD	G	Adequate

Notes: Flow Requirements (from BAH) include TRMM, Terra , Aqua, QuikScat, ~~ADEOS II~~

*Criteria:				Ratings Summary	Apr-04 Score	Req Prev	Oct-04 Score
	Excellent	Total Kbps > Requirement * 3		Excellent	5	5	5
	GOOD	1.3 * Requirement <= Total Kbps < Requirement * 3		GOOD	4	5	3
	Adequate	Requirement < Total Kbps < Requirement * 1.3		Adequate	4	3	5
	LOW	Total Kbps < Requirement		LOW	0	0	0
	BAD	Total Kbps < Requirement / 3		BAD	0	0	0
				Total	13	13	13
				GPA	3.08	3.15	3.00

Comparison of measured performance with Requirements:

This graph shows two bars for each source-destination pair. Each bar uses the same actual measured performance, but compares it to the requirements for two different times (March '04, and October. '04). Thus as the requirements increase, the same measured performance will be lower in comparison.
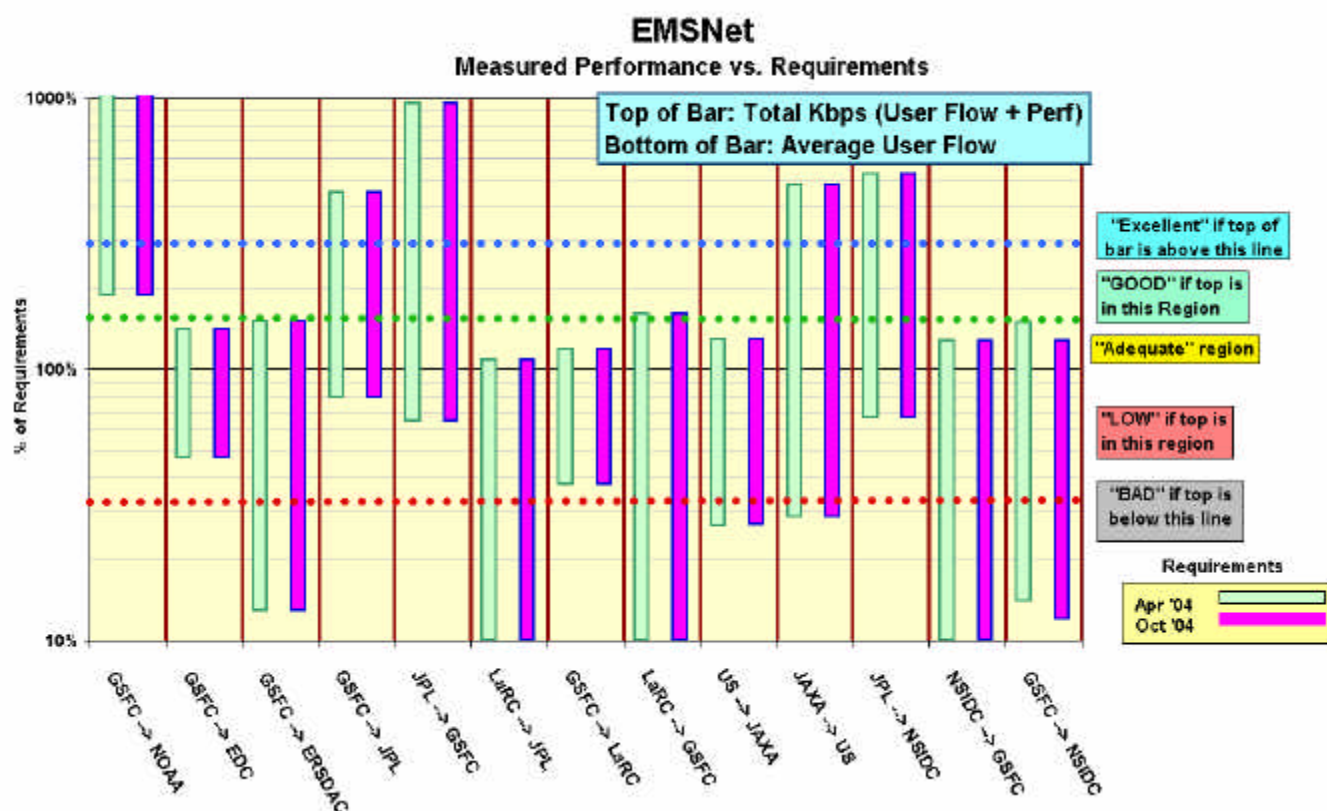
Note that this chart shows that the performance to all sites meets current requirements.

Also note that the interpretation of these bars has changed since Sept '01. The bottom of each bar is the average measured MRTG flow to that site (previously daily minimum). Thus the bottom of each bar can be used to assess the relationship between the requirements and actual flows. Note that the requirements include a 50% contingency factor above what was specified by the projects, so a value of 66% would indicate that the project is flowing as much data as requested.

Details on individual sites:

1) ASF   Rating: **N/A**
Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/ASF_EMS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	**Median**	**Worst**		
ASF → NESDIS	2.25	2.24	0.76	0.36	2.60
ASF → GSFC-CSAFS	2.74	2.47	1.07		
ASF→ JPL-SEAPAC	2.78	2.61	1.26		
GSFC-CSAFS → ASF	2.83	2.75	1.21	.05	2.80

ADEOS Requirement: (Deleted)

Source → Dest	FY	Mbps	Rating
ASF → NESDIS	October '03	1.86	**Good**

Comments: The 2.6 mbps total from ASF → NOAA is as expected for a 2 * T1 (3.1 mbps) circuit.

The requirement above is from ADEOS, and has been deleted. The remaining ASF requirements are very low, and mostly based on estimated ECS interDAAC queries, not production flows. These flow estimates are not considered reliable enough to use as a basis for testing, so the rating is "N/A". The rating would have remained "Good" vs. the October '03 requirement.

2) GSFC → EDC: Rating: Continued **Good**
Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/EDC.shtml `

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	**Median**	**Worst**		
GSFC-PTH → EDC-PTH	306.1	265.6	187.2	133.7	399.3
G-DAAC→ EDC LPDAAC	209.6	167.7	108.0		

Requirements:

Date	mbps	Rating
April, October '04	285.4	**Good**

Comments:
The rating is now based on testing between the GSFC performance test host ("GSFC-PTH"), located outside the ECS firewall and the EDC performance test host ("EDC-PTH"), also located outside the ECS firewall These results are considerably higher that from GDAAC to LPDAAC, and are considered to more accurately shows the capability of the WAN. This comparison of the two results show the effect of high levels of loading on the GDAAC and the ECS firewalls.

The performance was about the same as last month, after improving steadily from mid November through January, mostly due to the upgrade of the GSFC ECS firewall, and also the EDC ECS firewall (median from GDAAC was only 30 mbps in October, 60 mbps in November). This month the requirement increased to its FY '05 value (was 217 mbps last month). The combined iperf and MRTG still exceeds this requirement by a 30% margin, so the rating remains "Good".

3) JPL:

Ratings: GSFC → JPL: Continued **Excellent**
JPL → GSFC: Continued **Excellent**
LaRC → JPL: Continued **Adequate**

Web Pages:

http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_PODAAC.shtml
http://ensight.eos.nasa.gov/Networks/emsnet/JPL_TES.shtml
http://ensight.eos.nasa.gov/Missions/terra/JPL_MISR.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-CSAFS → JPL-SEAPAC	6.26	5.97	2.28	1.24	7.21
LaRC DAAC → JPL-TES	40.44	40.26	30.13	3.33	43.59
LaRC DAAC → JPL-MISR (ftp)	19.89	18.89	11.94		
JPL-PODAAC→ GSFC DAAC	12.32	12.24	7.71	0.40	12.64

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → JPL combined	April '04	1.60	**Excellent**
JPL → GSFC combined	April '04	0.63	**Excellent**
LaRC DAAC → JPL-TES	April '04	30.6	**Adequate**
LaRC DAAC → JPL-MISR	April '04	18.5	**Adequate**
LaRC DAAC → JPL-Combined	April '04	49.1	**Low**

Comments:

GSFC → JPL: Performance on this circuit has been mostly stable since the BOP switchover on 15 August '02. This month the total from GSFC-CSAFS → JPL-SEAPAC was a bit higher than last month; well above the requirement; the rating remains "Excellent".

LDAAC→ JPL: Performance testing from LDAAC to JPL-TES has been stable at 40 mbps since testing was restored on Feb 29. Iperf testing to TES was interrupted in April by security activities at JPL, but has recovered. Iperf testing to JPL-MISR was also blocked by JPL security, and has not recovered (working with JPL POCs to restore). So the MISR results above are from ftp testing, which is limited to about half the typical iperf performance due to TCP window size and RTT factors. This ftp performance has also been stable.

The measured thruput is above both the MISR and TES requirements, but below their combined value. However, the MISR requirement is open to some interpretation. The formal QA flow is only 9.7 mbps. But the science data also flows on the same circuit. This pushes the total MISR flow requirement to 18.5 mbps. When this 18.5 mbps MISR requirement is added to the 30.6 mbps TES requirement, the 49 mbps total requirement is higher than the measured performance, and also higher than the nominal circuit speed. Thus the rating remains "Low". But the rating would be "Adequate" based only on the formal QA requirement.

This configuration is based on a management decision to set the circuit capacity at this level to reduce cost, in the expectation that both projects' requirements are bursty and include contingency. Thus the actual requirements of both projects are expected to be met with this circuit capacity.

JPL → GSFC: The requirement from JPL to GSFC includes flows from NASDA and ASF which go via JPL, and includes GSFC and NOAA destinations. Since many of these flows were related to ADEOS, this requirement dropped substantially with the removal of ADEOS. The iperf flow increased abruptly from a stable 8 mbps to a stable 12 mbps on March 6, apparently due to a PVC change. The combined requirement is now only 0.63 mbps, and the combined 12.6 mbps thruput is more than 3 times that, so the rating remains "Excellent".

4) NSIDC:

Ratings: GSFC → NSIDC: Continued **Good**
NSIDC → GSFC: Continued **Adequate**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NSIDC_EMS.shtml

GSFC ←→ NSIDC Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	Median	Worst		
GSFC-PTH → NSIDC	91.6	90.9	43.3	9.3	100.2
GSFC-DAAC → NSIDC	91.3	89.8	25.8		
NSIDC → GSFC-DAAC	17.0	16.8	15.6	0.3	17.1

Requirements:

Source → Dest	Date	mbps	Rating
GSFC → NSIDC	April '04	66.9	**Good**
NSIDC → GSFC	April '04	13.3	**Adequate**

Comments:

GSFC → NSIDC: The rating is based on testing from the GSFC-PTH to the NSIDC DAAC. This node is outside the GSFC ECS firewall, and has the same peaks and median, but higher worst values compared to the GDAAC. Performance from the GDAAC to NSIDC improved in mid November, mostly due to the upgrade of the GSFC ECS firewall (The median was 35 mbps in October, and 55 mbps in November).

The requirement was increased again (was raised to 55.1 mbps in January '04). The current performance is still more than 30% above the increased requirement, so the rating remains "Good".

NSIDC → GSFC: Performance from NSIDC to GSFC remains steady, and the rating remains "Adequate".

Other Testing:

Source → Dest	Medians of daily tests (mbps)			Requirement	Rating
	Best	Median	Worst		
JPL → NSIDC-SIDADS	6.21	6.21	4.08	1.08	**Excellent**
GSFC-ISIPS → NSIDC (ftp)	7.20	6.67	5.82		
GSFC-ISIPS → NSIDC (iperf)	34.80	34.23	23.05		
NSIDC → GSFC-ISIPS (iperf)	17.11	17.07	15.32		
LDAAC → NSIDC	4.93	4.82	4.70	0.07	**Excellent**

Comments:

JPL → NSIDC-SIDADS: Performance has been very steady from JPL since the Aug '02 BOP switchover, exceeding the modest requirement (revised down from 1.5 mbps in November '03).

GSFC-ISIPS ← → NSIDC: Added iperf testing (reverse iperf, initiated by NSIDC) from ISIPS to NSIDC, in addition to ongoing ftp testing. Performance of ftp pulls by NSIDC from ISIPS remains very steady at 7 mbps, apparently limited by ftp window size. The iperf results show that a single stream is indeed limited to about 7 mbps, limited by the window size on the ISIPS HP-UX machine. But multiple stream iperf testing between the same machines in the same direction shows that the network is capable of much more thruput. Testing from NSIDC to ISIPS gets very similar thruput as NSIDC to GDAAC.

LDAAC → NSIDC: Thruput from LDAAC to NSIDC has been steady since August '03. The very low requirement produces a rating of "Excellent".

5) GSFC ←→ LaRC: Ratings: GDAAC → LDAAC: ↓ Good → **Adequate**
                                   LDAAC → GDAAC: Continued **Good**

Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/LARC.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	**Median**	**Worst**		
GDAAC → LDAAC	56.2	50.5	27.2	22.2	72.7
GSFC-PTH → LDAAC	58.8	48.4	14.0		
GSFC-PTH → LaTIS	58.7	41.2	7.6		
LDAAC → GDAAC	51.1	50.7	38.8	0.3	51.0

Requirements:

Source → Dest	Date	Mbps	Rating
GDAAC → LDAAC	April '04	59.4	**Adequate**
LDAAC → GDAAC	April '04	31.7	**Good**

Comments: **GSFC → LaRC**: Performance from GDAAC to LDAAC stable, but increased requirement kicked in this month, dropping rating to "Adequate" (requirement was 52.5 mbps last month – rating would have remained "Good"). Testing from GSFC-PTH to LDAAC is similar to testing from GDAAC, but slightly lower results (!). New testing this month from GSFC-PTH to LaTIS is similar, but with apparently more congestion at LaRC.

LaRC → GSFC: Performance remains stable since the June '03 upgrade to meet the backhaul requirements. The FY '04 requirement jumped from 6.8 mbps to 31.7 mbps in Oct '03, to incorporate this backhaul of all LaRC science outflow via GSFC (which has apparently not started thus far). The thruput is more than 30% above this requirement, so the Jan '04 rating remains "good".

6) NOAA NESDIS: Rating: Continued **Excellent**
Web Page: http://ensight.eos.nasa.gov/Networks/emsnet/NOAA_NESDIS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	**Median**	**Worst**		
GSFC-CSAFS → NESDIS	2.93	2.93	1.61	0.35	3.28
ASF → NESDIS	2.25	2.24	0.76		
JAXA (NASDA) → NESDIS	1.59	1.52	0.51		

Requirements:

Source → Dest	FY	Mbps	Rating
GSFC-CSAFS → NESDIS	'04	0.19	**Excellent**

Comments: With the deletion of the ADEOS flows from ASF, the dominant flow to NOAA is Quikscat data, from GSFC CSAFS.

Note that the 3.3 mbps total from CSAFS → NOAA exceeds the nominal 3.1 mbps for the 2 * T1 circuit. This shows the danger of adding together sampled medians. In this case the iperf tests are usually unaffected by the sporadic user flows, and normally get full circuit bandwidth. Adding the low but significant user flow then exceeds the circuit capacity. Since this is more than 3 times the FY '04 requirement, the rating is "Excellent".

Also note that the flow from NASDA is limited by the TCP window size of the NASDA test source, and the long RTT.

7) US ←→ JAXA (NASDA):   Ratings: US → JAXA: Continued **Adequate**
                                                    JAXA → US: Continued **Excellent**

Web Pages   http://ensight.eos.nasa.gov/Networks/emsnet/NASDA_EOC.shtml
              http://ensight.eos.nasa.gov/Networks/emsnet/JPL_SEAPAC.shtml
              http://ensight.eos.nasa.gov/Networks/emsnet/GSFC_SAFS.shtml

Test Results:

Source → Dest	Medians of daily tests (mbps)			User Flow	TOTAL
	Best	**Median**	**Worst**		
GSFC-CSAFS → JAXA-EOC	2.26	2.04	1.50	0.53	2.57
JAXA-EOC → JPL-SEAPAC	2.33	2.32	1.26	0.14	2.46
JAXA-EOC → GSFC-CSAFS	1.44	1.41	0.86		

Requirements

Source → Dest	Date	mbps	Rating
GSFC → JAXA	April '04	1.99	**Adequate**
JAXA → US	FY '03, '04	0.51	**Excellent**

Comments: US → JAXA: Performance steady -- about as expected for the 3 mbps ATM PVC (using multiple TCP streams to mitigate the TCP window size limitation at JAXA). Testing from ASF to NASDA stopped working in January; was restored in April. The requirements above were reduced in November '03, due to the removal of ADEOS flows. Thus the rating remains "Adequate".

But the requirements still include 4 ISTs at JAXA for AMSR-E. Each IST has a requirement for 311 kbps, for a total of 1244 kbps. This requirement causes the rating to be "Adequate", even though the performance was stable. It could be questioned whether JAXA intends to operate all four of the ISTs simultaneously, or whether some ISTs are backups, in which case the network requirements would be reduced to a lower value.

JAXA → US: Performance continues very stable. The requirement was reduced in November '03 due to the removal of ADEOS requirements, increasing the rating to "Excellent".

Note: JAXA has not yet implemented testing with multiple tcp streams. So performance to GSFC is limited by the TCP window size on JAXA's test machine, in conjunction with the long RTT. Therefore, in order to reflect the actual capability of network, the rating is derived from testing from JAXA to JPL. This test uses the same Trans-Pacific circuit, but has a shorter RTT, so will not be as severely limited by the TCP window size. The Trans-Pacific circuit connects into the higher speed domestic EMSnet at JPL, which is not expected to be the limiting factor.

8) GSFC → ERSDAC: Rating: Continued **Good**
Web Page :http://ensight.eos.nasa.gov/Networks/emsnet/ERSDAC.shtml

Test Results:

Source → Dest	Medians of daily tests (kbps)			User Flow	TOTAL
	Best	**Median**	**Worst**		
GSFC → ERSDAC	794	785	460	73	858

Requirements:

Source → Dest	FY	Kbps	Rating
GSFC → ERSDAC	'03, '04	568	**Good**

Comments: Thruput since June '02, using the 1 mbps ATM connection had been very stable (except for a problem period from 12 November '02 to 3 Jan '03). The requirement was revised down from 668 kbps in November '03, so the total user flow plus iperf is more than 30 % over the requirement, and the rating remains "Good".